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AUTHOR(S):

Ichimura, Shinichi

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# The Asian Sub-Link Project Symposium

## Econometric Models of East and Southeast Asian Developing Economies and Asian Link Model\*

Shinichi ICHIMURA\*\*

### I Econometric Models of East and Southeast Asian Developing Economies

Econometric models are very widely used in East and Southeast Asian countries (Korea, Taiwan, Hong Kong, the Philippines, Thailand, Malaysia, Singapore and Indonesia). This can be seen in "A List of Quantitative Models of the National Economies in Asian Countries," compiled by M. Ezaki and S. Ichimura. So far as the macro-models of national economies are concerned, they are strongly influenced by predecessors in developed economies. One can hardly find the difference between the models of developed economies and those of developing economies, if he compares the models presented by econometricians at the

Central Bank Conference in Seoul, Korea in June, 1976.<sup>1)</sup> But there are a number of models which are trying to depict the characteristics of developing economies particularly in recent years and in the countries where the shortage and deficiency of statistical data are being overcome.<sup>2)</sup>

Thus, short-term forecast models seem to have been constructed and used with some success even in developing countries in Asia, but they can hardly be useful in the analysis of major issues facing the developing economies. As good econometricians are trying to do in these countries, following some suggestions by

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\* This paper was originally prepared for the LINK meeting in Kyoto, Japan, September, 1977 and was revised to make it an introduction to the Proceedings of the Asian Sub-Link Project Symposium, held in Kyoto on March 22-24, 1979, under the auspices of The Japanese Society for Asian Studies and with the support of the Kansai Economic Research Center.

\*\* 市村真一, The Center for Southeast Asian Studies, Kyoto University

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1) *Proceedings of the Second Pacific Basin Central Bank Conference On Econometric Modeling*. The Bank of Korea, 1977.

2) Such an example is Virabongsa Ramangkura, "A Macro-econometric model For Thailand —A Classical Approach," in *Finance, Trade and Economic Development in Thailand*, edited by Prateep Sondysuvan, Sompong Press, Bangkok, 1975; and the article by the Bank of Thailand's econometricians published in this issue of *Southeast Asian Studies*.

L. R. Klein,<sup>3)</sup> they try to incorporate into the models such characteristics: (a) limitations of output capacity rather than the shortage of effective demand, (b) juxtaposition of existing investment opportunities and non-existence of well-organized capital market and hence the importance of inflow of foreign capital and direct investment, (c) the important role of government economic policies, (d) the importance of environmental factors like climate or political disturbances on the economic activities, (e) the

significant influence of foreign trade sector and the economic cooperation from international agencies and developed countries and so on. Since, however, the characteristics of developing economies in this part of Asia are somewhat different from those of the countries in South Asia, Middle East, Africa or Latin America, they may be briefly described here so as to be useful for the construction of econometric models for the countries in this region.

## II Different Scales of the Economies and Stages of Development

Table 1 shows how different the scale of the economy from one country to another is and also how much the stage of economic development differs between Singapore and Indonesia or Laos. Notice also the difference in the rate of growth. They can be classified into five groups:

Group A: Small scale city states, industrialized and commercial centers and rapidly growing—Singapore and Hong Kong.

Group B: Medium size national

economies, semi-industrialized, rapidly growing homogeneous population economies — S. Korea and Taiwan.

Group C: Medium-large size national economies, beginning to be industrialized but still primarily agricultural and fairly homogeneous population economies — Thailand and the Philippines.

Group D: Unique countries — Malaysia and Indonesia

Group E: Socialist states — Vietnam, Laos, Cambodia and Burma. Burma is like Yugoslavia in Eastern Europe.

The countries in Group A and B are developing some manufacturing industries that compete with Japanese industries in the US and other markets.

3) L. R. Klein, "What kind of Macroeconomic Model in Developing Economies," *Econometric Annual of the Indian Economic Journal*, 1965. What makes it particularly difficult to incorporate the supply side is the unavailability of capital stock data and unemployment figures. A number of progresses have been made in this area of research. See, for instance, Philip M. Hauser, "The Measurement of Labor Utilization—more empirical results," *Malayan Economic Review*, April, 1977.

**Table 1** An Overall Picture of East & Southeast Asia

Population (million)	mid-74	60-74	65-74	mid-75	GNP (75)	GNP per capita (74)	(75)	60-74	65-74
China	809.3	1.6	1.7	822.8	286.0	(300)	350	5.2	4.6
Indonesia	128.4	2.1	2.3	131.6	24.2*	(170)	180	2.4	4.1
Japan	109.7	1.1	1.2	111.0	495.2	(4,070)	4,460	8.8	8.5
Vietnam	44.2	3.0	3.0	45.3	7.1	(150)	160	0.3	-0.8
Philippines	41.4	3.0	3.0	42.5	15.7	(330)	370	2.4	2.7
Thailand	40.8	3.1	3.1	41.9	14.5	(310)	350	4.6	4.3
Korea, S.	33.5	2.1	1.8	34.1	18.7	(480)	550	7.3	8.7
Burma	29.5	2.2	2.2	30.2	3.3	(100)	110	0.7	0.8
Taiwan	15.7	2.9	2.7	16.0	14.2	(810)	890	6.5	6.9
Korea, N.	15.4	2.8	2.8	13.6	6.8	(390)	430	4.4	3.5
Malaysia	11.7	2.6	2.6	12.0	8.7	(680)	720	3.9	3.8
Cambodia	7.7	2.5	2.7	8.0	**(.57) n.a.	(70)	n.a.	-2.7	-6.2
Hong Kong	4.3	2.2	1.9	4.4	7.5	(1,610)	1,720	6.6	5.4
Laos	3.3	2.4	2.4	3.3	**(.22) n.a.	(70)	n.a.	5.3	5.8
Singapore	2.2	2.1	1.8	2.3	5.6	(2,240)	2,510	7.6	10.0

Source: World Bank Atlas &amp; National Statistics

\* Official but preliminary estimate=30.5 which gives GNP per capita 230.

\*\* Figures for 74, World Bank Atlas.

**Table 2** Agriculture

	% of Agr. Pop.	% in GDP 71-76	Rice in 70	75	per capita	Growth Rate in Rice Pr.	Pop. Growth Rate	Deffer- ence
China	80		240*	270*				
Vietnam	80							
Laos	79							
Cambodia	78							
Burma	69	38. - 36.3	8,162	9,221	0.12	13.0	11.6	1.4
Indonesia	62.2	43.6 - 37.2	19,337	22,570	0.17	16.7	12.6	4.1
Thailand	58.4	29.6 - 26.4	13,270	15,300	0.36	15.3	16.8	-1.5
Philippines	54.5	28.9 - 26.4	5,343	6,217	0.15	16.4	14.6	1.8
Korea, S.	46.7	29.5 - 23.0	5,476	6,429	0.18	17.4	9.4	8.0
Malaysia	46.6	31.2 - 29.9	1,670	2,020	0.17	20.9	15.2	5.7
Taiwan	29.1	15.3 - 13.8	3,226	3,043	0.19	-5.7	10.3	-16.0
Hong Kong	3.9							
Singapore	2.0							

\* For China only, food grains (million tons).

**Table 3** Foreign Trade in 1975

	Y/N	$\Delta Y/Y$	$\Delta Pc/Pc$	X/Y	M/Y
Singapore	2,442	4.1	-2.8	209.8	316.9
Malaysia	706	2.5	3.0	40.9	38.6
Thailand	349	5.0	5.2	15.1	22.4
Philippines	362	5.8	5.8	14.4	24.4
Indonesia	143	7.5	21.1	37.9	25.1
Burma	109	6.1	18.3	4.8	3.4

Notes: Y: Gross Domestic Product; N: Population; Pc: Consumers Price Index;  
X: Exports; M: Imports;  $\Delta$  means the increment of some variable

Table 4 Concentration of Foreign Trade

Indonesia	Philippines	Malaysia	Singapore	Thailand	Burma
Oil = 73.4	Sugar = 25.3	Rubber = 22.9	Oil Pr. = 26.7	Rice = 12.1	Rice = 55.8
Timber = 7.3	Copra = 10.0	Palm Oil = 14.8	Elec-tronics = 11.5	Maize = 11.8	Timber = 23.6
Rubber = 5.4	Copper = 9.2	Tin = 13.7	Rubber = 10.4	Tapioca = 9.5	Min. Pr. = 5.4
	Timber = 8.5	Timber = 12.7	Ind. Mach. = 7.0	Rubber = 7.1	
		Oil = 9.8			
Sub-Total = 86.1	53.0	73.9	55.6	40.5	84.8
Japan = 53.1	37.7	14.4	8.7	25.6	10.8
U.S. = 20.5	28.9	16.1	13.9	10.2	(Ind'sia) 13.8
Singapore = 7.5	(Engl.) 3.6	20.3	(Malay) 17.2	(Singap.) 8.4	(China) 22.3
W.Germany = 2.1	2.9	13.0	(H.K.) 7.3	(H.K.) 5.6	(Singap.) 6.6
Netherland = 1.9	7.7	(Engl.) 6.0	(E.C.) 13.4	(Neth.) 9.4	(H.K.) 4.4
85.1	80.8	69.9	60.5	59.2	57.9
Machinery = 31.0	18.9	10.2	22.0	36.2	27.7
Transp.M. = 13.7	8.7				
Food = 11.3		6.6			(Met. Pr.) 16.2
Steel = 7.3	6.2		6.7	(Chem. Fer.) 14.3	6.2
Chem. Fer. = 17.3	(Oil) 22.3	7.2	24.5	(Oil) 22.3	46.3
80.6	56.1		53.2	72.8	
Japan = 30.3	27.9	20.1	16.9	33.0	23.0
U.S. = 16.0	21.8	10.7	15.7	15.0	(China) 8.0
W.Germany = 8.4	3.8	(E.C.) 22.7	13.0	5.4	(Austra.) 4.9
Singapore = 6.6	(M. East) 15.3	(Sing.) 8.5	(Malay) 11.6	(Engl.) 4.7	(W. Ger.) 4.8
China = 4.1			(M. East) 8.7	(S. Arab) 9.4	(Singap.) 4.0
65.4	68.8	62.0	65.9	67.5	44.7

### III The Importance of Agriculture

In all of these countries agriculture is still very important. Thanks to the characteristics of rice-growing, dependent on the well-developed, intensive cultivation and water control system in Asia, agricultural production is much less fluctuating in this part of the world and has been rising steadily at more than 3% annual rate of growth over two decades. Although one should not miss the long-term implication of the shortage of land, as is shown below, on the limitations of Asian Agriculture.<sup>4)</sup>

The stable growth and high potentials for future industrialization due to farmers' industry and saving in this part of Asia have depended and will depend on steady increase in rice production and generally good circumstances for tree agriculture. Table 2 shows such an importance of agriculture and especially rice-economy. Any good models must

are: (hectares).

North America 2.10; West Europe 0.37; U.S.S.R. 1.50; Asia 0.34; Africa 2.10; South America 2.30

Source: *The World's Food Problem*. A report by US Presidential Economic Advisory Committee, 1967

4) Per capita arable land in different continents

contain the equations for production, demand and the price behavior equations for rice and other crops. Import and Export of rice are very important for all these countries. Stability of the price of

rice is often crucial to economic and political stability of the nation. There are already some good models of the rice economy available.<sup>5)</sup>

#### **IV Concentration of Foreign Trade and Its International Competition**

Table 3 and 4 shows how significant the foreign trade sector is to the national economies of these Asian countries. At such a relative low level of per capita income, they depend heavily on foreign trade. Moreover, their dependence is concentrated in a few items in exports and a few countries, particularly the U.S. and Japan. Hence any good models should incorporate these aspects into the behavior equations. No models constructed so far seem to have paid enough attention to this aspect. But this requires a classification of exports and imports by commodities and destination and the corresponding data for prices and explanatory variables of trading

partners. Only in the recent years they have become available for a number of countries. Needless to say, linkage with the models of Japan and U.S. economies are highly desirable.

As the capacity of import-substitution industries increases and the new export industries are developed, the items of exports and imports and their destinations change quickly in these countries. This relation between the supply side of industrialization and international trade requires a careful model-building. Satisfactory models are still to be constructed in the future. This aspect is particularly important for Korea, Taiwan, Hong Kong and Singapore.

#### **V Rapid Change in Industrial Composition and Export-Import Structure**

These four countries seem to follow the path of industrialization similar to Japan. The next figure shows the Korean time-series of the commodity composition of exports and the degree of industrialization measured by the percentage share of manufacturing industries' value added in GDP. This shows that even in the model based on the data on the past ten years, careful attention has to be given to the change in industrial composition of

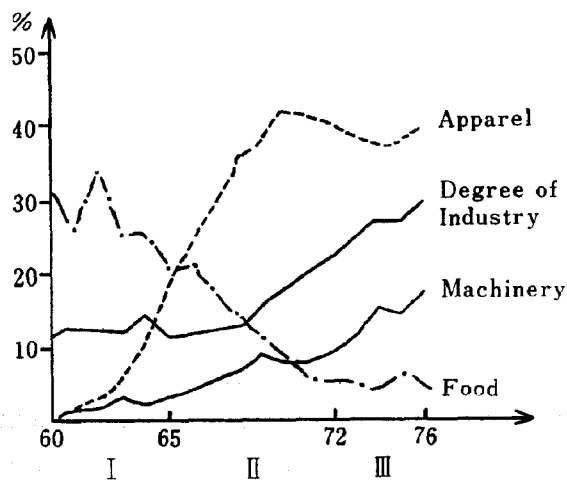
manufacturing sector and its impact on foreign trade. Naturally as the commodity composition changes, the destination also changes. For instance, Korean exports to Middle East and EC

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5) See, for instance, H. Tsujii, "A Quantitative Model of the World Rice Market and Analysis of the National Rice Policies with Special Reference to Thailand, Indonesia, Japan and the United States," presented at the Third World Congress of the Econometric Society, Toronto, Canada, August, 1975.

occupied only 5.3% in 71 but 18.9% in 76.

In the models of these four countries for the forecast or analysis in the 70's or early 80's, their competition against Japan needs a particular care, because they are expanding the export of the commodities which Japan has been exporting to the U.S. and Asian markets.



If we take the items of Japanese exports to the U.S. over 10 mill. dollars whose shares exceed 15%, they are 57 items and occupy about 62% of Japanese exports to the U.S.. In all of these items, they are expanding their shares very rapidly. Examples are: textiles, plywood, shoes, radio, TV, electric balls, bicycles, typewriters, sewing-machines, pins, thin boards, etc. Similar observations can be made on the Asian market and the Japanese market itself. It is very difficult to construct a model which can handle this aspect of international competition. I have been trying to produce a model for

Japan — Korea — Taiwan competition but have not succeeded in getting any good results as yet. Difficulty lies in the fact that sectoral break-downs are required, but each sector is too small to bear any good empirical analysis.

As for production functions and investment behaviors, macro-functions covering the nationwide or the whole industry behavior equation do not seem to give any good results mainly due to data deficiency for labor and capital and simultaneous expansion of all domestic variables and fluctuating inflows of foreign capital and aid. The dependence on foreign capital is very significant. For instance:

	Foreign Cap.	Dom. Saving	%
Korea	41.7	58.3	(72-76)
Taiwan	36.5	63.5	(72-75)
Singapore	42.9	57.1	(71-75)

The foreign capital inflow is very specific in some industries.<sup>6)</sup> Here too are reasons for sectoral break-downs are needed but difficult. One is often forced to satisfy oneself by the models based on simple capital/output ratio types of models for these reasons.

6) See, for instance, K. Yoshihara, *Japanese Investment in Southeast Asia*. University Press of Hawaii, 1978; as for the analysis of the change in industrial composition, see M. Ezaki, "Growth Accounting of the Philippines: The Demand for Output Side," *South East Asian Studies*, Vol. 15, No. 1, 1977.

## VI Some Considerations of External and Domestic Policies

The outstanding debts at the end of 1975 are the following. The implications of these debts must be incorporated into the models.

	Debt	D/GDP	D/service
Korea	6.99	37.4	11.3
Taiwan	3.13	21.7	4.0
Singapore	3.38*	60.4	
Philippines	4.07**	25.6	
Ind'sia	11.28	42.7	
Thailand	3.94	27.1	
Malaysia	.71	8.7	

\* provisional, \*\* Sept. 1975

Government policies about foreign investment, custom duties, subsidies to exports, tax-exemption for exports, preferential loans to export industry, special

pricing policies for exportable products *vs.* domestically consumed goods, exchange rate policies, import restrictions, minimum wage regulations, control of foreign employees *etc.* are all effectively utilized. These usual or unusual policy instruments must be kept in mind when models of developing economies are constructed. So far few models are meant to analyze the effects of such policies. The impact of foreign economic cooperation of a large amount or some specific policies is often much more effective in developing economies than most developed countries. Econometric models of developing countries, therefore, must have some features of planning or programming models.

## VII The Asian Sub-Link Project Symposium

At the Project Link meeting in Kyoto, September, 1977, a request was made to initiate an effort of constructing a regional link-model in Asia that includes some developing countries in the region. Since then, the present writer has tried to organize the Asian Link Project by obtaining the agreement of the authorities and experts who have been engaged in econometric model-building in East and Southeast Asian countries. The first outcome of this project was the Asian Sub-Link Project Symposium held at the Kyoto University Hall in Kyoto, March 22–24, 1979.

The articles presented in the symposium and the speakers were:<sup>7)</sup>

1. Mitsuo Ezaki (The Center for Southeast Asian Studies, Kyoto University):  
Linking National Econometric Models of Japan, USA, And The East And Southeast Asian Countries: A Pilot Study

7) In this issue, the papers (1), (2), (4), (7), (8), and (10) only are published. The other papers will be published subsequently. The authors of (8) are: Olarn Chaipravat, Kanitta Meesook and Siri Ganjarende; (11), Susan B. Daniel and Satoshi Yasuda; (12), Luisa E. Sabater.



2. Hyun-chul Shin (The Bank of Korea):  
The Bank of Korea Econometric Model
  3. Yen-Kyun Wang (Korean International Economic Institute):  
Specification and Simulation of a Macro-Econometric Model for Measuring the Effects of Commercial Policies in a Developing Economy: The Case of Korea
  4. Yi-chung Chiu (Council for Economic Planning and Development, Executive Yuan, Taiwan):  
A Quarterly Econometric Forecasting Model For Taiwan Economy
  5. Sheng-Yann Lii (Council for Economic Planning and Development):  
An Analysis of the Taiwan Economy, 1953-73
  6. Virgilio T. Velasco (Asian Institute of Management):  
Survey of Macro-Econometric Models of the Philippines
  7. Tzong-biau Lin (The Chinese University of Hong Kong):  
The ERC Forecasting Model For the Hong Kong Economy
  8. Olarn Chaipravat (The Bank of Thailand):  
The Bank of Thailand Model of the Thai Economy
  9. Slangor and Hindromarsono (The Bank of Indonesia):  
"A Simple Macroeconomic Model of Indonesia"
  10. Chikashi Moriguchi (The Institute of Economic Research, Kyoto University):  
The Kyoto University Quarterly Model of the Japanese Economy
  11. Shinichi Ichimura (The Center for Southeast Asian Studies, Kyoto University):  
Data Research On Linking National Econometric Models Of Japan, USA And The East And Southeast Asian Countries
  12. Ho-dac Tuong (UNCTAD):  
Econometric Modelling of Developing Countries
- All the papers have been carefully discussed by assigned discussants and other participants.<sup>8)</sup> After the symposium research effort has been made in several directions:
- (1) The link-model of Ezaki type has been extended to include practical national econometric models, instead of prototype models, one by one.
  - (2) Japanese export and import functions with the standard Link Project breakdowns and country destina-

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8) Participants other than speakers are: Minoru Hanada & Takao Arai (The Bank of Japan); Jong-Goo Park (Asian Development Bank); Toru Yanagihara (Institute for Developing Economies); Koichi Baba & Seiji Shinpo (Economic Planning Agency); Yoichi Kaya, Hisashi Ishitani & Tadao Uchida (The University of Tokyo); Ippei Sugiura & Seishi Hirai (Wakayama University); Shuntaro Shishido (Tsukuba University); Akira Onishi (Soka University); Kazumi Kobayashi (Kyoto Sangyo University); Mitsuo Saito (Kobe University); Yasuoki Takagi (Doshisha University); J. L. Tamba (National Institute of Social & Economic Research, Indonesia); Hiroshi Tsujii, Kunio Yoshihara, Susan B. Daniel & Satoshi Yasuda (Kyoto University).

tions in the paper (11) are to be linked with Moriguchi's Model in the paper (10).

- (3) Programs are being developed to incorporate one developing economy model after another into the World Link Model.

- (4) Some national econometric models are reexamined and being improved. The fruits of these research works will be made available, as they are accomplished in the near future.